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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,086	10/16/2003	Vishnu K. Agarwal	MICRON.095C1	9081
20995	7590	07/19/2005	EXAMINER	
KNOBBE MARTENS OLSON & BEAR LLP 2040 MAIN STREET FOURTEENTH FLOOR IRVINE, CA 92614			HU, SHOUXIANG	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 07/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

SM

# Office Action Summary

Application No.

10/687,086

Applicant(s)

AGARWAL ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 13 May 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) 11-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 23-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Election/Restrictions*

Claims 11-22 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper dated 12/20/2004.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10 and 23-33 are rejected under 35 U.S.C. 103(a) as being obvious over Lu (Lu et al. EP 854505 A2, of record) in view of Lur (Lur et al., 5,364,803, of record).

Lu discloses a gate structure in an integrated circuit structure (Fig. 3; also see page 4, lines 36-37), comprising: a  $\text{TiN}_x\text{B}_y$  barrier layer overlying a dielectric layer (5; a gate oxide) and underlying a conductive layer comprising tungsten in a gate electrode (14).

Lu further discloses that the gate electrode (14) can be a poly-tungsten stack for lowering the sheet resistance of the gate electrode structure (see page 4, lines 30-31). It is noted that the term of "poly-tungsten stack" commonly means a polysilicon-tungsten

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stack with a polysilicon layer underlying a tungsten or tungsten silicide layer (as evidenced in Lur et al., 5,364,803; see the polysilicon layer 14 and the tungsten silicide layer 18 in Figs. 1 and 2). And, Lu further discloses that the  $TiN_xB_y$  layer can be between the gate stack and the gate dielectric layer (see page 4, lines 35-37).

Although Lu does not expressly disclose that the tungsten-comprised conductive layer in the gate stack can further comprise at least some fluorine atoms, one of ordinary skill in the art would readily recognize that a tungsten or tungsten silicide layer formed in a poly-tungsten gate stack with desired quality and process condition normally inherently comprises at least some fluorine atoms when being formed with the art-known common CVD method that involves a fluorine-containing gas (as evidenced in Lur, see col. 2, lines 28-29).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the CVD method of Lur into the making of the device of Lu, so that a gate structure with desired quality would be obtained with desired process condition. And, the tungsten or tungsten silicide conductive layer in the above collectively taught device would inherently comprises at least some fluorine atoms; thus the  $TiN_xB_y$  layer in the above collectively taught device would be naturally capable of functioning as a diffusion barrier layer that prevents the fluorine atoms in the conductive layer from reaching to the underlying dielectric layer.

Regarding claims 2-4, 7, 25-27 and 30, it is noted that the thicknesses of the dielectric layer, the polysilicon layer, the  $TiN_xB_y$  layer and the tungsten-containing layer in the gate structure are all art-recognized parameters of importance subject to routine

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experimentation and optimization. It would be well within the ordinary skill in the art to form these layers in the gate structure with their thicknesses being respectively about 30 to 200 angstroms, about 300 to 1,500 angstroms, about 50-500 angstroms, and about 200 to 4,000 angstroms, through routine experimentation and optimization, as they are all well within or overlapping with the commonly recognized individual ranges for these layers, as further evidenced in Lur (see col. 2, lines 43-64).

Regarding claims 9 and 32, it is noted that it is art-known that an intrinsically doped monocrystalline silicon wafer is a common type of wafer used for forming a semiconductor substrate.

Regarding claims 10 and 33, it is noted that the device in Lu is a memory device that naturally further comprises an operable portion of a transistor array on the substrate.

### ***Response to Arguments***

Applicant's arguments filed on May 13, 2005 have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Moreover, in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be

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established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Lu discloses the claimed invention except the recited fluorine atoms or ions included in the conductive layer made of tungsten or tungsten silicide. Lur was cited by the examiner to show that it is art known that such a tungsten or tungsten silicide layer can be commonly formed with a CVD method that involves a fluorine-containing gas.

Accordingly, the combined teachings of Lu and Lur would naturally result in the claimed invention, since the tungsten or tungsten silicide conductive layer in the collectively taught device would inherently comprises at least some fluorine atoms due to the involved fluorine-containing gas. Thus the  $TiN_xB_y$  layer in the collectively taught device would be naturally capable of functioning as a diffusion barrier layer that prevents the fluorine atoms in the conductive layer from reaching to the underlying dielectric layer.

And, it would be well within the ordinary skill in the art to incorporate the CVD method of Lur into the making of the device of Lu, so that a gate structure with desired quality would be obtained with desired process condition.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH

July 14, 2005

A handwritten signature in black ink, appearing to read "Shouxiang Hu", written in a cursive style.

**SHOUXIANG HU**  
**PRIMARY EXAMINER**